Short Communication

Preparation of Large-scale SnO$_2$:F Transparent Conductive Film by Atmospheric Spray Pyrolysis Deposition and The Effect of Fluorine-doping

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High-quality SnO$_2$:F films with an area of 15×15 cm$^2$ were prepared from stannic chloride (SnCl$_4$) solution via a house-made ultrasonic spray pyrolysis instrument. The focus of this investigation was on the volatilization of solution and doping process of fluorine, the main influencing factors on F doping content, and the effects of F doping content on the crystal structure, surface morphology, electrical, and optical properties. The results indicated that the crystallinity was enhanced with increasing doping concentration; the films exhibited (101) oriented growth and the resistivity decreased at first and then increased. During the preparation route, the droplet momentum and the temperature field above the hot plate demonstrate the most dominate influence on the film’s properties. The spray droplet gradually hydrolyzed during the moving process from sprinkler to substrate while the F doping content decreased with the increasing distance between the sprinkler and the substrate. By controlling the doping of F, high-quality and large area SnO$_2$:F films with a resistivity of 1.2×10$^{-3}$ Ω·cm and a visible light transmittance of 82% were prepared, demonstrating a promising application for organic solar cells and low emissivity glass.

Keywords: transparent conductive films; low emissivity glass; SnO$_2$:F; ultrasonic spray pyrolysis

FULL TEXT

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